

US-PAT-NO: 6412006

DOCUMENT-IDENTIFIER: US 6412006 B1

TITLE: Method and apparatus for sending delay sensitive information assisted by packet switched networks

DATE-ISSUED: June 25, 2002

INVENTOR-INFORMATION:

| NAME | CITY | STATE | ZIP CODE | COUNTRY |
|--------------------|-------------|-------|----------|---------|
| Naudus; Stanley T. | Springfield | VA | N/A | N/A |

US-CL-CURRENT: 709/227, 370/437 , 709/239 , 709/242

ABSTRACT: A method and apparatus for sending delay sensitive information assisted by packet switched networks for network nodes in a computer network. Delay sensitive information such as voice information is sent over higher cost delay sensitive connections. Control and status information for the delay sensitive connections is sent in control messages over lower cost packet switched connections to the nodes in the computer network. Information in the control messages is stored in status tables on the network nodes. The status table is used by network nodes to determine the status of any delay sensitive connections in the computer network and is used to establish a lowest cost connection path or a desired quality of service connection path when a delay sensitive connection between network nodes is requested. Sending delay sensitive control and status information over the lower cost packet switch connections to the network nodes and using status tables on the network nodes to establish delay sensitive connections significantly decreases the costs associated with using delay sensitive connections.

16 Claims, 7 Drawing figures

Exemplary Claim Number: 9

Number of Drawing Sheets: 6

----- KWIC -----

Abstract Text - ABTX (1): A method and apparatus for sending delay sensitive information assisted by packet switched networks for network nodes in a computer network. Delay sensitive information such as voice information is sent over higher cost delay sensitive connections. Control and status information for the delay sensitive connections is sent in control messages over lower cost packet switched connections to the nodes in the computer network. Information in the control messages is stored in status tables on the network nodes. The status table is used by network nodes to determine the status of any delay sensitive connections in the computer network and is used to establish a lowest cost connection path or a desired quality of service connection path when a delay sensitive connection between network nodes is requested. Sending delay sensitive control and status information over the lower cost packet switch connections to the network nodes and using status tables on the network nodes to establish delay sensitive connections significantly decreases the costs associated with using delay sensitive connections.

Brief Summary Text - BSTX (2): The present invention relates to control signaling and data transfer in a computer network. More specifically, it relates to a method and apparatus for sending delay sensitive information on a higher cost network connection while sending non-delay sensitive control and status information on a lower cost network connection.

Brief Summary Text - BSTX (16): Selected network nodes have a delay sensitive connection to a delay sensitive network for sending and receiving delay sensitive information such as voice and real-time video. The delay sensitive connections include multiple delay sensitive connection channels. A selection input is received on a first network node to change the status of a delay sensitive connection between the first network node and a second network node (e.g., requesting a new delay sensitive connection). The status of the delay sensitive connection is changed based on the selection input (e.g., establishing a delay sensitive connection). A control message with a predetermined protocol is sent on the packet switched network to the other network nodes in the computer network indicating the change in status of the delay sensitive connection. The control messages are used by other network nodes to make connection decisions and establish the lowest cost delay sensitive connections. The lowest cost delay sensitive connection may be an indirect, multi-hop delay sensitive connection and may utilize idle delay sensitive channels on a previously established delay sensitive connection between two network nodes. The lowest cost delay sensitive connection may also be a shortest path delay sensitive connection, or a lowest cost delay sensitive connection with a desired quality of service.

Detailed Description Text - DETX (14): FIG. 2 is a flow diagram illustrating a method 28 for determining the status of a delay sensitive connection from any network node (12, 14, 16) in computer network 10. At step 30, a selection input is received on a first network node to change the status of a delay sensitive connection between the first network node and a second network node (e.g., a request to make a delay sensitive connection). Status of the delay sensitive connection is changed based on the selection input at step 32 (e.g., a delay sensitive connection is established, and an individual channel is chosen). A control message with a predetermined protocol is sent on the packet switched network from the first network node over the packet switched connection to the other network nodes in the computer network indicating the change in status of the delay sensitive connection at step 34. The control message may be a single broadcast control message sent to each of network nodes, or multiple individual control messages sent to each of the network nodes.

Detailed Description Text - DETX (18): FIGS. 3A and 3B are block diagrams illustrating aspects of method 28 of FIG. 2. As is shown in FIG. 3A, node A 12 in computer network 10 receives a selection input at step 30 (FIG. 2) to make a voice call to node B 14 via a delay sensitive connection. A delay sensitive connection 36 is established between node A 12 and node B 14 via delay sensitive network 24 with multiple delay sensitive channels, four of which are illustrated (38, 40, 42, 44) in FIG. 3A. Only four channels are illustrated in FIG. 3A. However, the invention is not limited to four channels, and more or fewer channels can be used. In FIG. 3A, the

remaining channels (40, 42, 44) are not currently in use and are illustrated with a different type of dashed line. The establishment of connection 36 indicates a change in status at step 32 (FIG. 2) of connection 36. A first control message with a predetermined protocol is sent at step 34 (FIG. 2) to nodes (14,16) in computer network 10 via packet switched connection 18 (not shown in FIG. 3A) to indicate the change in status of connection 36. Node A 12 can send a message to itself over the packet switched network, or simply update delay sensitive channel information stored in its status table since it received the selection input at step 30 (FIG. 2).

Detailed Description Text - DETX (20): As is shown in FIG. 3B, node C 16 now desires to make a voice call to node B 14. Node C 16 has status information in its status table as a result of a control messages indicating that node A 12 has a delay sensitive connection 36 with three available channels (40, 42, 44) to node B 14. In addition, the status table information allows node C 16 to determine that a direct call to node B 14 is more expensive than an indirect call to node B 14 via node A 12. For example, the call from A to B is local, the call from C to A is local, while the call from C to B is long distance.

Detailed Description Text - DETX (22): Node C 16 requests that node A 12 make an additional delay sensitive connection to node B 14 with a second available channel 44. Node C 16 has a virtual connection 56 to node B 14 with an indirect multi-hop delay sensitive connection (48, 44) at a lowest possible cost. Method 28 (FIG. 2) is used to send control messages to indicate the change in status for creating the delay sensitive connections 36 and 46, and the change in delay sensitive connection channels 38, 44, and 48. The control messages are stored in a status table such as the example status table shown in Table 2 below.

Claims Text - CLTX (4): sending a control message with a predetermined protocol on the packet switched network from the first network node to the other network nodes in the computer network indicating the change in status of the delay sensitive connection,

Claims Text - CLTX (20): maintaining on the network nodes status tables containing information from control messages sent over the packet switched connection to the network nodes indicating changes in status of delay sensitive connections in the computer network;